Block 23. Avoidance, Minimization, and Compensation

Donlin Gold Project
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Donlin Gold, LLC (Donlin Gold) has planned the proposed project to avoid and minimize impacts to Waters of the United States (WOUS) to the extent practicable during the construction, operation, reclamation, and closure phases of the project. The following is a description of avoidance and minimization efforts for the proposed project. For ease of explanation the narrative has been grouped by the three distinct project areas: Mine Area (MA), Transportation Area (TA), and Pipeline Area (PA). A description of compensatory mitigation follows the avoidance and minimization discussions.

Mine Area (MA)

The proposed facilities in the MA include the open pit, waste rock facility (WRF), tailings storage facility (TSF), mill facilities, shop, power plant, stockpiles, fuel storage, water management facilities, laydown areas, material sites, connecting roads, and other associated facilities. Figure 1 depicts the watersheds in the proposed MA. The proposed mine footprint encompasses approximately 9,000 acres. There are approximately 6,430 acres of uplands within the proposed mine footprint, and 2,570 acres of wetlands. The following measures to avoid and minimize impacts to WOUS were included in the project design and construction plans.

Avoidance and Minimization during Design

- Placement of Facilities to Avoid and Minimize WOUS Impacts – Due to the abundance of wetlands within the project area, avoiding all fill discharges into WOUS is not practicable. The 2007 Preliminary Jurisdictional Determination (PJD) (Michael Baker International 2017a, 2017b) delineation for the project shows that ridgetops and hillsides at higher elevations in watersheds are upland, while WOUS are more prevalent in valley bottoms and hillsides at lower elevations in watersheds. The proposed project infrastructure layout maximizes the use of uplands, while minimizing WOUS encroachment to the extent practicable. Potential mine impacts were reduced by placing facilities in fewer watersheds and WOUS. Facility placement and design are typically more efficient on flatter ground. However, to avoid WOUS, the facilities were placed on upland ridges as feasible; where additional site preparation work will be needed to provide level and stable pads.

- Anadromous and Resident Fish Habitat – The proposed locations of the WRF, TSF, mine facilities, Snow Gulch freshwater reservoir and material sites, and north and south overburden and material sites avoid anadromous fish habitat. Resident Dolly Varden are the only species of fish observed at higher creek elevations in the American and Anaconda Creek watersheds. See Figure 2 for the extent of Anadromous and Resident Fish within the proposed MA.

- Open Pit – The open pit is immovable and irreplaceable in nature. Design criteria included: access to the mineral resources; minimizing waste rock volumes; maintaining pit wall stability; and minimizing disturbance footprint. Studies were completed to determine the steepest practicable wall slopes to maintain stability, and consequently minimize the surface disturbance of the pit. The impacts to WOUS by the open pit are unavoidable, and have been minimized to the extent practicable.

Figure 1 Watersheds within the Proposed Mine Area

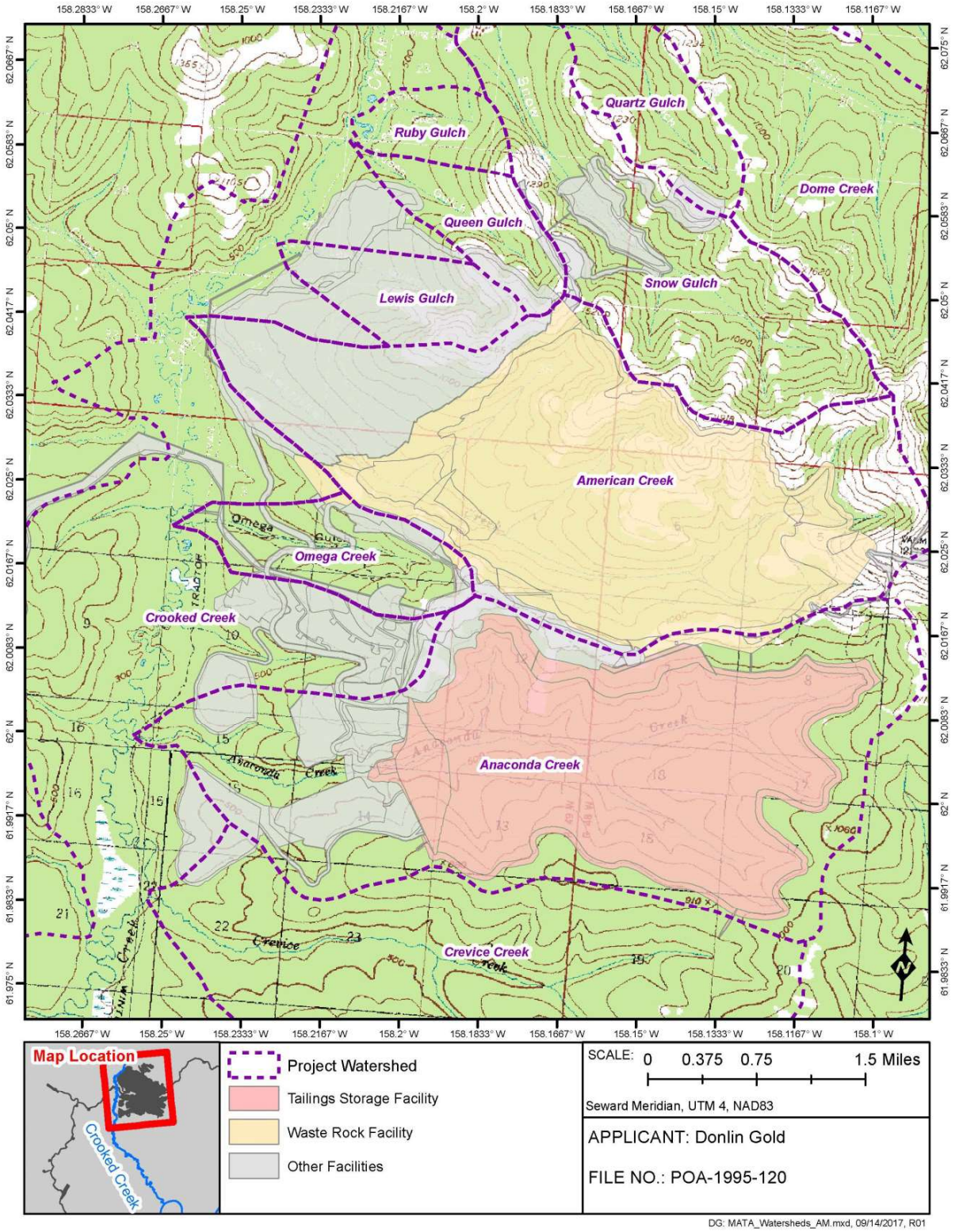
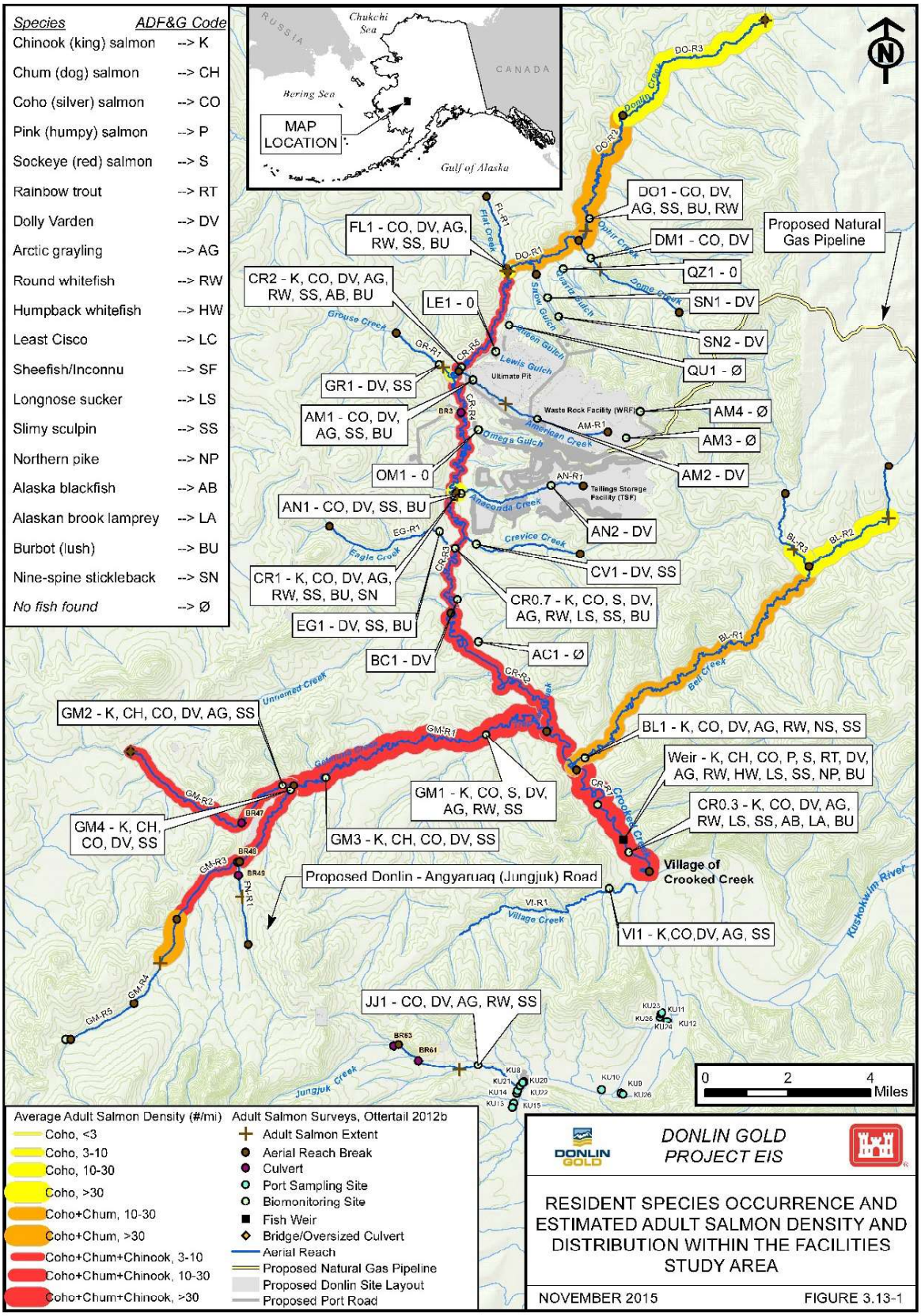


Figure 2 Anadromous and Resident Fish Habitat Extent



- Waste Rock Facility – General design criteria for the WRF location included: capacity to store approximately 2,449 million short tons (Mst) of waste rock and 46 Mst of overburden fill; ability to manage runoff water; proximity to the open pit to minimize transportation costs; wetlands avoidance and minimization; and geotechnical factors such as hydrology, slope stability, and seismic stability. Potential locations for storage of waste rock considered placement of all waste rock in the American Creek valley, or splitting the waste rock storage between American Creek and Anaconda Creek or Snow Gulch. Siting the WRF within American Creek watershed provided the most practical option because of the proximity to the open pit to minimize transportation cost, and the ability to use the open pit to control runoff post mine closure. The WRF minimizes WOUS impacts with a compact footprint located in the upper watershed of American Creek. The WRF was designed to an overall slope of 3(H):1(V). This design allowed for placement of all waste rock within the American Creek valley, to an elevation of 1,705 feet above sea level, avoiding potential impacts from waste rock management in Snow Gulch or Anaconda Creek valley.

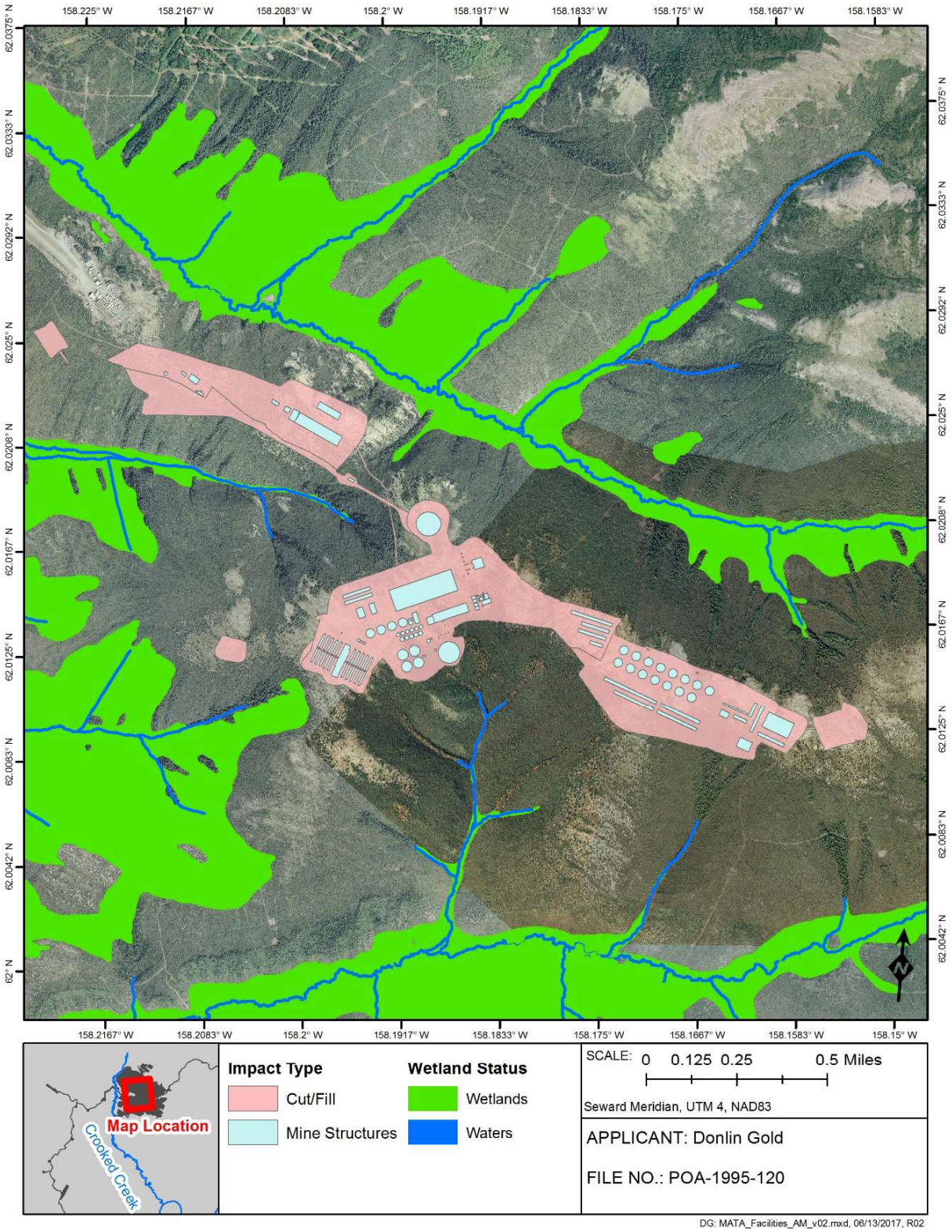
- Tailings Storage Facility – General design criteria for the TSF location included: capacity to store 334,298 acre-feet of tailings; proximity to the MA facilities to minimize tailings transportation costs; wetlands avoidance and minimization; and geotechnical factors such as hydrology, slope stability, and seismic stability. Potential locations for storage of tailings considered placement of all tailings in the Anaconda Creek, Crevice Creek, and Snow Gulch valleys, or dividing the tailings between the Anaconda Creek and American Creek valleys. Siting the TSF within the Anaconda Creek valley provided the most practical option because of the proximity to the MA facilities, availability of construction material sources, and capacity to manage tailings within a single area. The TSF minimizes WOUS impacts with a compact footprint. The TSF dam was designed with a maximum height of approximately 462 feet to maximize the storage capacity within the east half, or upper reaches of the Anaconda Creek valley, thus limiting the TSF footprint and avoiding additional wetland impacts in the lower valley, closer to Crooked Creek; avoiding potential impacts from TSF management in Snow Gulch or American Creek valley. It is not feasible to collocate the WRF and TSF in one valley.

- Mine Area Facilities – General design criteria for the MA facilities included: sufficient space to accommodate mine facilities (e.g., crusher, processing facility, power plant, fuel storage, and laydown pads); proximity to the open pit, ore stockpile, and TSF to minimize ore and tailings transportation costs; geometrically designing pads with the lowest volumes of cut and fill; wetlands avoidance through strategic location of facilities; and factors such as hydrology, and soil stability. Potential locations for the MA facilities considered included the lower (near Crooked Creek) or middle portion of the American Creek ridge because of proximity to the open pit and TSF. The lower American Creek ridge location would have resulted in longer roads to the ore stockpile and TSF and greater impacts to WOUS. Locating the facilities in the middle portion of the American ridge avoided all impacts to WOUS. See Figure 3.

- Material Sites – Material sites are necessary for the construction of mine facilities and roads. River floodplains are typically valuable sources of aggregate material. Donlin Gold recognized early in the MA development that using material near Crooked Creek would likely have impacts

to anadromous fish reaches. All material sites chosen were sited outside the floodplain of Crooked Creek. The material sites identified are immovable and irreplaceable in nature. The sites identified provide high volume, high-quality material, while minimizing access road distances. The amount of aggregate estimated to be required was minimized by designing facilities and roads that would need the least material to construct and maintain. The material site required for the Snow Gulch freshwater dam has been sited on a ridgetop where suitable material is present to avoid WOUS. In summary, although some material sites are in WOUS, they were sited outside of the Crooked Creek floodplain and away from headwater streams.

Figure 3 Mine Facilities Footprint



- Mine Roads – Mine roads are used to transport personnel, goods, and materials between mine facilities. These roads have been designed to meet traffic and safety requirements for the mine truck fleet. General design criteria for locating mine roads included: development of a two-lane transportation route that is suitable for mine trucks, safe transport of mine supplies with a grade of less than eight percent; minimizing construction and maintenance costs; geometrically designing roads with the lowest volumes of fill; minimizing drainage crossings and locating necessary crossings at hydrologically prudent locations; locating suitable material sites within proximity of the proposed project to minimize road construction cost and associated impacts of material site access roads; and avoidance and minimization of impacts to WOUS. The length of road access required was minimized by the compact design of the mine facilities, which shortened the distance between areas and minimized impacts to WOUS. Where practicable, mine roads were designed to reach multiple locations via the same access, and avoid the need for secondary roads and additional WOUS impacts.

- Laydown Pads – Laydown pads are areas to store equipment and mine supplies. General design criteria for locating laydown pads included: proximity to mine facilities; geometrically designing pads with the lowest volumes of cut and fill; wetlands avoidance and minimization; and factors such as hydrology and soil stability. Where practicable, laydown areas were located in uplands and adjacent to other pads to minimize mine road construction needs and additional impacts to WOUS, including stream crossings. Development of laydown areas at the MA adjacent to long-term disturbance areas reduces the need for additional equipment and material storage at the proposed Jungjuk (Angyaruaq) Port.

- Facilities Co-located with Other Facilities – Where practicable, facilities were designed to share space and accommodate multiple uses to minimize the project ground disturbance footprint. Two proposed material sites within the Omega and Anaconda drainages will be used as overburden storage areas after the required material volume has been extracted. The ore stockpile and contact water dams have been located within the footprint of the WRF.

- Road Stream and Drainage Crossings – The mine roads were designed to minimize the number of stream and drainage crossings. Where these were unavoidable, the road was designed to approach each WOUS perpendicular to the flow to minimize WOUS impacts. Bridge structures or culverts will be installed at each stream and drainage crossing to facilitate vehicle passage and minimize impacts. Bridge structures will be installed at major crossings. Minor stream crossings and drainages will have culverts installed to ensure cross-flow and hydrologic connectivity. Crooked Creek is only crossed once at the MA. A full-span bridge, with no in-channel supports, will be used to avoid impacts to Crooked Creek. Retaining walls would be installed as needed to contain road embankment fill. See Engineering Drawings TA-310D1a through TA-310D1b of the Crooked Creek Bridge.

- Mine Area Restoration – The TSF Material Site-06/ TSF Stockpile 2 and TSF Material Site-07/TSF Stockpile 3 within the Anaconda drainage will be used as growth media storage areas after the material has been extracted. Post mine, the growth media fills will be removed and used for reclamation purposes, and the sites will be returned to WOUS. See Block 23 CMP Attachment C for a detailed description of proposed MA restoration plan related to these facilities.

- Condemnation Drilling – Condemnation drilling tests were conducted under the mine facilities to verify that no recoverable minerals occur, so that facilities could be sited without the risk of future relocation impacting additional WOUS.

- Reclamation and Closure – A reclamation and closure plan has been prepared for the mine. To summarize: stockpiled overburden and organic materials will be used to reclaim the WRF, TSF, pads, material sites, and the majority of mine roads. While some of the reclaimed areas will no longer meet WOUS criteria, these areas will provide habitat for wildlife species and native plants.

Minimization During Construction

- Vegetation Clearing Activities – Vegetation clearing for the proposed MA facilities will be scheduled to occur outside the migratory bird nesting season as best possible consistent with the United States Fish and Wildlife Service (USFWS) guidance. If avoiding the suggested window is not possible, the area will be surveyed for the presence of nests immediately prior to clearing activities during the restricted clearing periods, and identified nests can be provided appropriate protection; or if otherwise authorized by permit from the USFWS. The Migratory Bird Treaty Act (MBTA) prohibits the killing or harassment of migratory birds, and migratory bird nests, eggs, or nestlings if work were to be conducted in nesting habitat during the spring and summer breeding season. Clearing will not be conducted outside established vegetation clearing boundary limits. Cut vegetation will be piled within the project disturbance limits, so as not to block surface water flows or adversely affect nearby WOUS except when used to provide Best Management Practices (BMPs) for stormwater management under the Multi-Sector General Permit (MSGP).

- Erosion Control Measures – Erosion control and construction methods will be described in the Donlin Gold Stormwater Pollution Prevention Plan (SWPPP) required by the State of Alaska 2015 MSGP for Stormwater Discharges Associated with Industrial Activity. BMPs for embankment stabilization, including contouring and seeding will be employed project-wide to reduce embankment erosion and potential sediment runoff into WOUS. The State of Alaska will provide a Certification under Section 401 of the Clean Water Act. The Donling Gold Project will comply with the State's Water Quality Standards.

- Construction in Drainages – To minimize potential sediment suspension and transport, stream crossing structures will be constructed during periods of low flow or normal flow regimes. Water diversion structures will be implemented where required.

- Temporary Construction Work Areas – Temporary construction work areas (buffers) are located adjacent to all proposed MA facilities to provide a transition between proposed cut and fill locations and adjacent land use. Buffer widths vary, but are typically 25 feet. Trees and tall shrubs will be cut, but organic soil and root mass will be left intact as practicable. Stumps will only be removed if it is determined that intact stumps would pose a risk to the installation of structures, the movement of equipment, or the safety of personnel. Stockpiled materials will not be placed in WOUS. Existing disturbed areas for temporary construction activities will be used to the maximum extent possible to avoid new disturbance.

- Development of Material Sites – Material sites within Omega Gulch and Anaconda Creek watersheds would have unavoidable impacts to WOUS. The following construction guidelines are provided to limit the disturbance footprint, prevent impacts to nearby WOUS, and minimize the overall footprint to WOUS. Construction considerations for material sites include:
    - Source material testing for metal leaching and acid rock drainage potential will be completed on hard rock material sites prior to mining. Material that does not meet environmental standards will not be used as fill. By not using acid generating and metal leaching material, water quality standards will be met.
    - Material site and work area boundaries will be surveyed and monumented with a Global Positioning System (GPS) device as well as physically marked, using rebar stakes and flagging prior to breaking ground to avoid impacting WOUS outside of the permitted area.
    - Vegetation and organic soils will be stockpiled separately from overburden in uplands as practicable for future use in reclamation.
    - Appropriate offsets will be provided between overburden berms and the active pit areas.
    - Material work pads will be used in summer construction over thaw-unstable permafrost and any overlaying wetlands and soft soils; the organic layer will be left intact to slow thermal degradation and to aid in final reclamation.
    - Mining will proceed in a benched manner. Individual benches will be no more than 40 feet apart vertically, and will be no narrower than 20 feet wide. Multiple benches can be in production at one time, with slope angles of approximately 2 Horizontal (H):1 Vertical (V).
- Material Sites Reclamation – Material sites will be reclaimed following these guidelines:
    - Grade overburden or unusable material piles after use to slopes of 3(H):1(V), or flatter.
    - Except where the steepness of the wall makes it impractical or impossible, pits and quarry walls will be reclaimed as follows:
        - The pit and quarry walls will be reclaimed when future development is not required.
        - Pit and quarry walls will be graded to 2(H):1(V) or flatter. Stockpiled overburden or unusable material can be used for grading.
        - Available organic soils will be spread over re-graded slopes. Spread available vegetative material over the organic soils to aid re-establishment of native species, and seed as necessary.
        - At the end of use, un-reclaimed faces will be scaled of loose and dangerous rock so that the faces are left in a condition such that they will not collapse or allow loose rock to present a safety hazard.
        - The pit floor or pad will be graded to a flat or gently sloping shape, and all equipment and non-native debris and waste will be removed.

  - The active work area will be reclaimed with access roads and culverts removed and reclaimed when access is no longer needed.

- Invasive Plant Species – Construction activities requiring re-seeding of vegetation cover will utilize certified seed materials meeting requirements of the State of Alaska Seed Regulations (11 Alaska Administrative Code [AAC] 34 Articles 1 & 4) regarding purity, germination, and weed restrictions. Construction BMPs will be employed to keep equipment clean and prevent the spread of invasive species. BMPs can include establishing an equipment cleaning practice, invasive species education for staff and contractors, scheduling work at times when plants do not have viable seeds, using certified weed-free erosion control products, controlling invasive species at material sites, disposing of spoil and vegetation contaminated with invasive species appropriately, re-vegetating with local native plant species, and developing a monitoring and treatment plan. Stream corridors are pathways for the spread of invasive species. Crooked Creek has only one bridged crossing, and the project includes only one facility (treated water discharge facility) near the floodplain, thus minimizing the potential for invasive species to spread through the downstream Crooked Creek floodplain.

- Spill Prevention – Procedures to avoid or minimize the potential for spills into WOUS will be implemented. Refueling activities and fuel storage will take place in uplands and 100 feet from WOUS, except under the following circumstances: equipment that is not mobile or must remain on site for prolonged periods to safely complete a construction task (e.g., drill rigs, cranes for structure installation, water pumps) may be refueled in wetlands, providing that proper temporary spill prevention, control, and containment procedures are employed. In addition, there is only one crossing of Crooked Creek and one facility in the floodplain, minimizing the risk of spills reaching Crooked Creek.

- Fugitive Dust Control – The Donlin Gold Project (Project) incorporates design features that minimize dust emissions that have the potential to adversely affect local air quality from ore processing activities (e.g., ore crushing, ore conveying, and stockpiling of crushed ore) through a combination of emissions capture and control, and enclosures. A Fugitive Dust Control Plan (FDCP) has been developed, which includes BMPs to minimize fugitive dust emissions.

Transportation Area (TA)

The proposed facilities in the TA include the Jungjuk (Angyaruaq) Port, a 30-mile mine access road, a 5,000-foot airstrip and connecting road, a camp with associated utility corridors, and material sites with associated access roads. The following measures were included in the Project to avoid and minimize impacts to WOUS.

Avoidance and Minimization During Design

- Transportation Area Alternatives – Project development considered two practical port location alternatives: Birch Tree Crossing (BTC) and Jungjuk (Angyaruaq) Port, each with a road connecting the port to the proposed MA. In evaluating each port/road alternative, the following engineering design criteria were utilized: development of a two-lane transportation road that is safe for transporting mine supplies with a grade of less than eight percent; minimizing construction and maintenance costs; geometrically designing a facility with the lowest volumes of fill; minimizing drainage crossings and placing crossings perpendicular to flow, locating

suitable material sites close to the proposed road to reduce impacts of material site access roads. The BTC route is 76 miles long and would require 32 material sites (1,012 acres total), with potential to impact 285 acres of WOUS. The Jungjuk (Angyaruaq) Port is 30 miles long, and requires 13 material sites (431 acres total), impacting 36 acres of WOUS. The BTC road itself would impact approximately 260 acres; while the Jungjuk (Angyaruaq) Port road would impact 55 acres of WOUS. The selection of the Jungjuk (Angyaruaq) Port site over the BTC port site and associated roads and material sites, results in reduced wetland impacts.

- Placement of Facilities to Avoid and Minimize Impacts to WOUS – TA facilities were located on upland ridgetops instead of wetter hillsides and valleys, as practicable, or sited away from WOUS. Examples of this are: the Donlin-Jungjuk Road (Figure 4), camp (Figure 5), and airstrip (Figure 6). The TA project facilities require the development of 13 material sites, five of which would impact WOUS. Material site boundaries were adjusted to avoid and minimize impacts to WOUS, as practicable. The transportation facilities are designed to limit the number of watersheds disturbed. The road leaving the port first climbs up out of the Jungjuk Creek watershed, then enters the Crooked Creek watershed, where is remains for the remainder of the route. After crossing the Getmuna tributary to Crooked Creek, the road straddles the ridge line/drainage divide between Crooked Creek and the Iditarod River watershed to the west, but does not impact wetlands in that watershed. The airstrip is the only other facility located outside the Crooked Creek watershed, but is located on a ridge line, avoiding wetlands (see Figure 6). The airstrip was placed on a ridgetop to minimize the amount of cut and fill in WOUS.

- Jungjuk (Angyaruaq) Port Design – The port location selection criteria included: distance to the mine to minimize road footprint and transportation costs; avoidance of private land; adequate depth to dock and maneuver barges throughout the summer season without the need to dredge; avoidance of cultural resources; avoidance of WOUS; minimization of the amount of onshore grading; minimization of the probability of water or ice jams overtopping the wharf during the freshet; and sizing to fit 1,000 Twenty-foot Equivalent Units (TEU); stackable containers. The proposed Jungjuk (Angyaruaq) Port is 30.5 acres and includes 16.2 acres of unavoidable impacts to WOUS. The Jungjuk (Angyaruaq) Port footprint was reduced by: planning to store cargo temporarily rather than permanently for transport to and from the mine; transporting cargo in stackable TEU containers; and stacking loaded containers up to three TEUs high, and empty containers up to six TEUs high. Following mine closure, the port will be reclaimed by removing the wharf fills, including sheet pile, and the area will be re-contoured leaving the access road and a “beach-type” landing in place.

- Co-located Facilities – Where practicable, facilities will share space or accommodate multiple uses to minimize the Project ground disturbance footprint: the proposed camp facilities will be constructed within the disturbance footprint of Material Site-01; non-wetland material sites will be used for the temporary storage of construction equipment, refueling, and overburden storage during construction; the airport will be placed in the closest practicable location to the Donlin-Jungjuk Road. The Donlin-Jungjuk Road will be used to gain access to the airport with a short spur road. Transmission lines were designed parallel to roads to reduce access route footprints and the number of drainages disturbed.

- Road Stream and Drainage Crossings – The Donlin-Jungjuk Road was designed to minimize the number of stream and drainage crossings by following upland ridgelines to the extent practicable (Figure 4). Where stream crossings were unavoidable, the road approaches are designed to be perpendicular to the flow to minimize WOUS impacts. Bridge structures and/or culverts will be installed at each stream and drainage crossing to facilitate vehicle passage and minimize impacts. Bridge structures will be installed at six major stream crossings where fish presence has been identified. Each bridge was designed to span the width of the creek, either as a steel span or steel span arch, and designed to account for high-water flow conditions. Riprap will be placed along the length of the arch or wall bases on both the upstream and downstream ends of the structure to protect the arch bases from erosion. Minor stream crossings and drainages will have appropriately sized culverts installed to ensure cross flow and maintain hydrologic connectivity. The State of Alaska will provide a Certification under Section 401 of the Clean Water Act. The Project will comply with the State's Water Quality Standards.

- Material Site Restoration – Material sites that impact WOUS were evaluated to determine viable opportunities to offset impacts through restoration. Material Sites-01, 05, 10, 12, and 16 have unavoidable impacts to WOUS. Material Sites-10, 12, and 16 were identified as most likely to provide wetland restoration and creation opportunities based on proximity to groundwater hydrology and final grading elevations. Block 23 CMP Attachment F describes Donlin Gold's plans to restore wetlands in these areas.

Figure 4 Transportation Corridor – Avoidance Measures

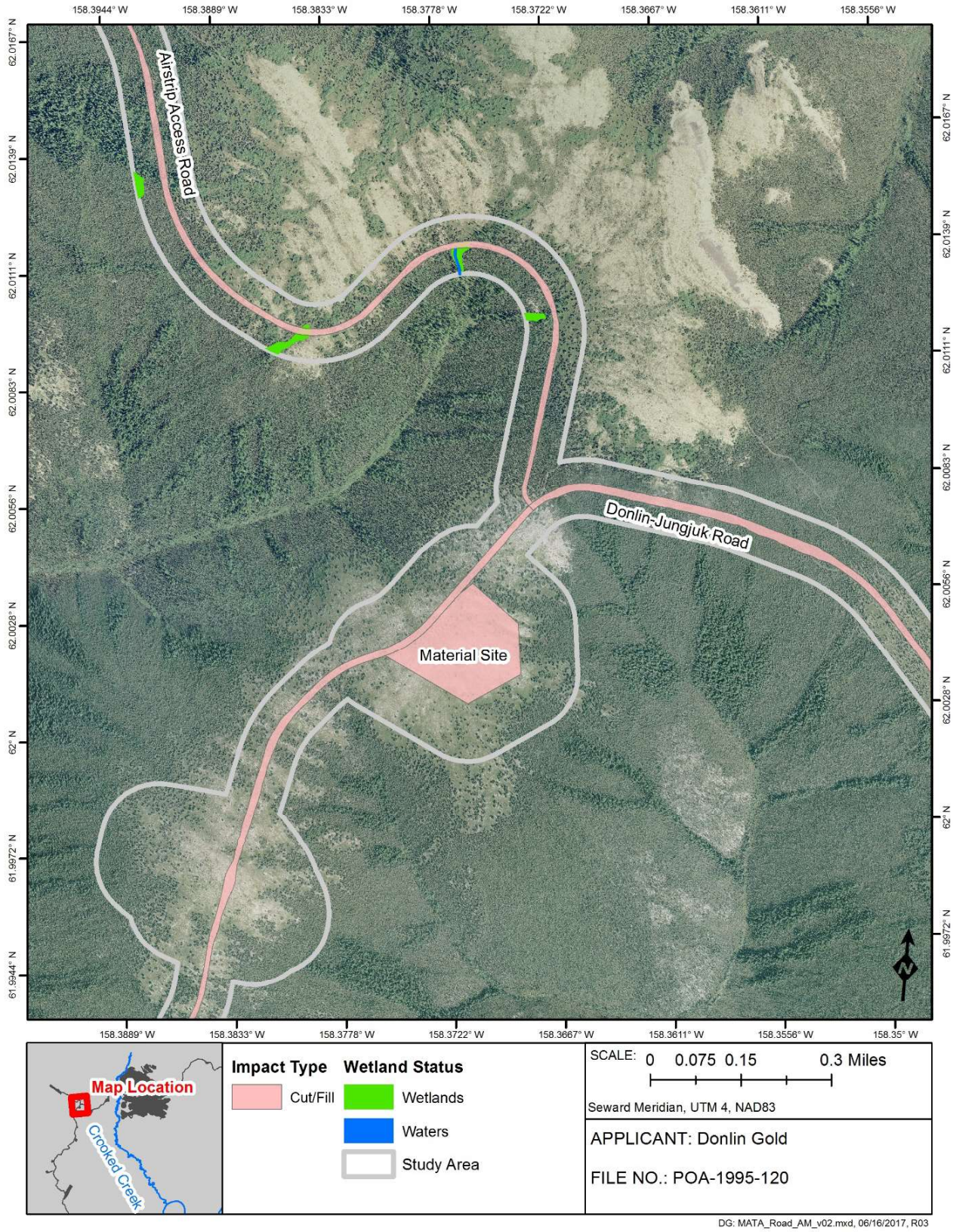


Figure 5 Camp Facilities Location

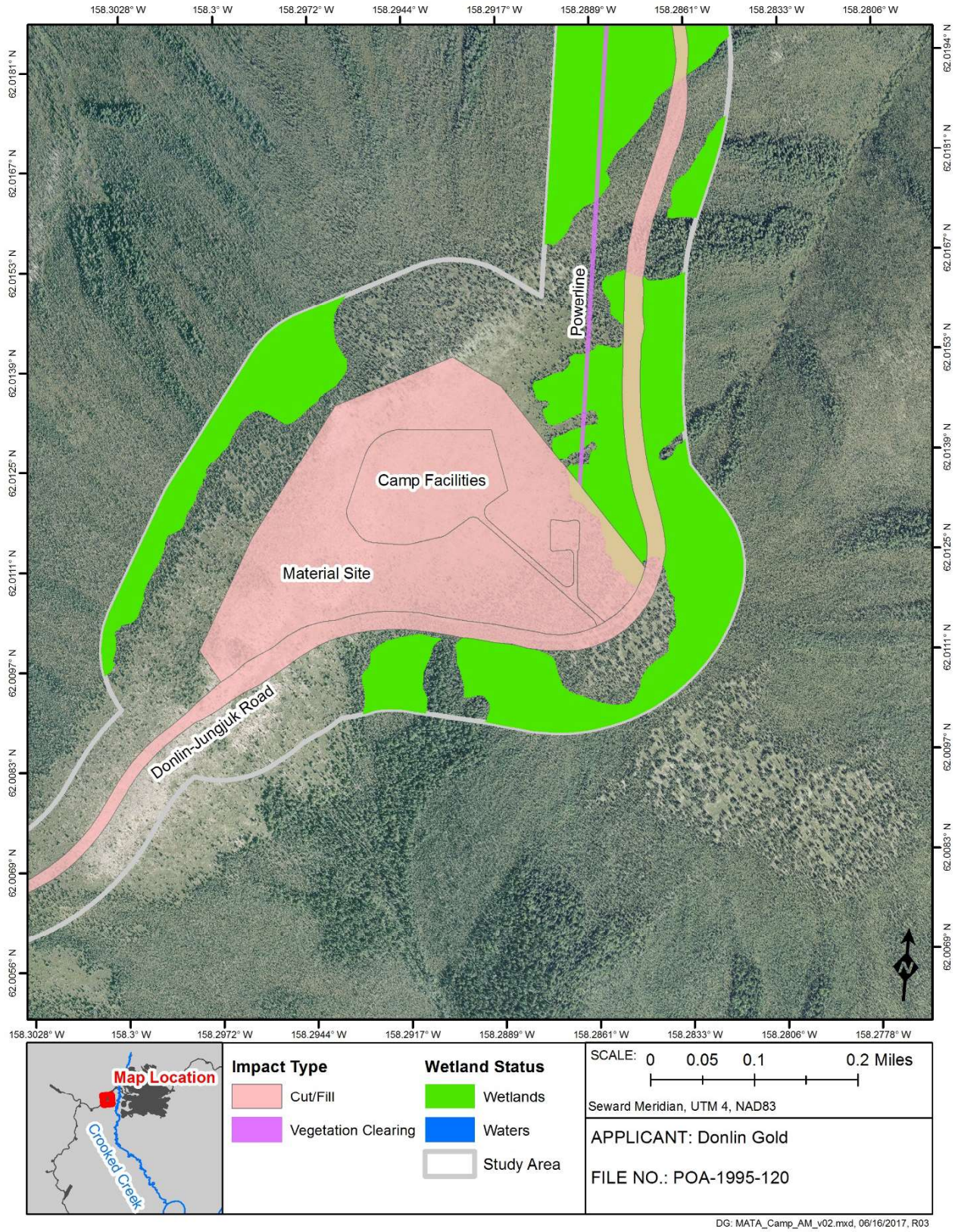
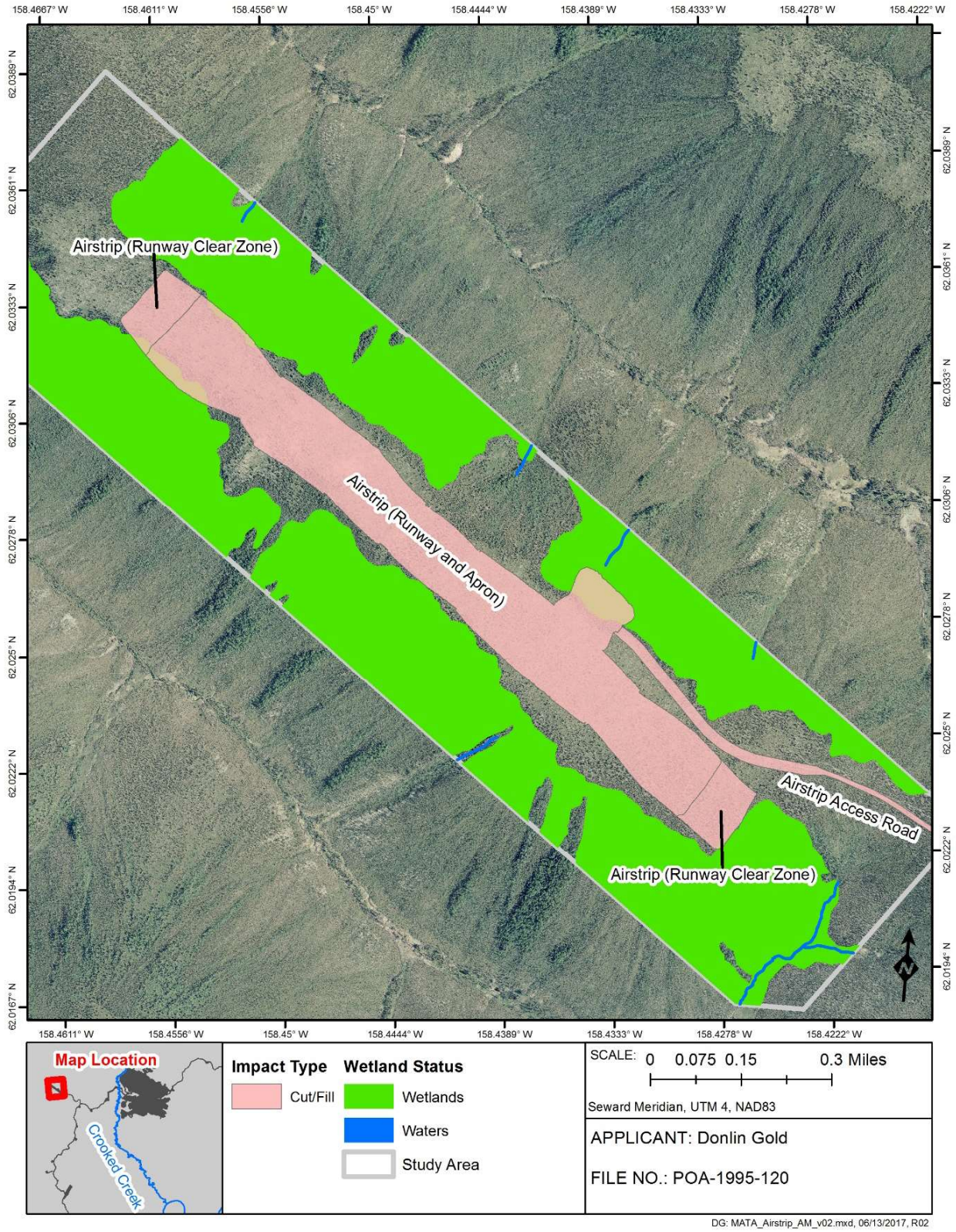


Figure 6 Airstrip Location



Minimization During Construction

- Vegetation Clearing Activities – Vegetation clearing for the proposed TA facilities will be scheduled to occur outside the migratory bird nesting season as best possible, consistent with USFWS guidance. If avoiding the suggested window is not possible, the area will be surveyed for the presence of nests immediately prior to clearing activities during the restricted clearing periods, and identified nest can be provided appropriate protection; or if otherwise authorized by permit from the USFWS. The MBTA prohibits the killing or harassment of migratory birds, and migratory bird nests, eggs, or nestlings if work were to be conducted in nesting habitat during the spring and summer breeding season. Clearing will not be conducted outside established vegetation clearing boundary limits. Cut vegetation will be piled within the Project disturbance limits, so as not to block surface water flows or adversely affect nearby WOUS except when used to provide BMPs for stormwater management under the MSGP.

- Erosion Control Measures – Erosion control and construction methods will be described in the SWPPP required by the State of Alaska 2016 Construction General Permit for Stormwater Discharges for Large and Small Construction Activities. BMPs for embankment stabilization, including contouring and seeding, will be required Project-wide to reduce embankment erosion and potential sediment runoff into WOUS. Stockpiling of material, equipment staging, and mobilization will avoid WOUS, as practicable. When filling in wetlands, temporary straw waddles, silt fencing, or other BMPs will be employed to reduce sediment runoff into temporary short-term fill areas. Embankments will be tracked and stabilized in accordance with BMPs to prevent embankment erosion and sediment runoff. The State of Alaska will provide a Certification under Section 401 of the Clean Water Act. The Project will comply with the State's Water Quality Standards.

- Construction in Drainages – To minimize potential sediment suspension and transport, culverts and bridges will be constructed during periods of low flow or normal flow.

- Temporary Construction Work Areas – Temporary construction work areas (buffers) are provided adjacent to all proposed TA facilities. Buffers vary in width, but are typically 25 feet. Trees and tall shrubs will be cut, but organic soil and vegetative mat will be left intact and stockpiled materials will not be placed in WOUS, as practicable. Stumps will only be removed if it is determined intact stumps pose a risk to the installation of structures, the movement of equipment, or the safety of personnel.

- Development of Material Sites – Material Sites-01, 05, 10, 12, and 16 have unavoidable impacts to WOUS. The following construction guidelines limit the disturbance footprint, prevent impacts to nearby WOUS, and minimize the overall impacts to WOUS. Construction considerations for material sites included:

    - Source material testing for metal leaching and acid rock drainage potential will be completed on hard rock material sites prior to mining. Material that does not meet environmental standards will not be used as fill. By not using acid generating and metal leaching material, water quality standards will be met.

- Material site and work area boundaries will be surveyed and marked with high visibility stakes and flagging prior to breaking ground to avoid impacting WOUS outside of the permitted area.
- Vegetation and organic soils will be stockpiled separately from overburden in uplands as practicable for future use in reclamation.
- Appropriate offsets (10 feet typical) will be provided between overburden berms and the active pits.
- Mining will proceed in a benched manner. Individual benches will be no more than 40 feet apart vertically, and will be no narrower than 20 feet wide. Multiple benches can be in production at one time, with slope angles of approximately 2(H):1(V).

- Material Sites Reclamation – When no longer needed, material sites will be reclaimed following these guidelines:
  - Overburden or unusable material piles will be graded after use to slopes of 3(H):1(V), or flatter.
  - Except where the steepness of the wall makes it impractical or impossible, pits and quarry walls will be reclaimed as follows:
    - Pit or quarry walls will be reclaimed when future development is not required.
    - Pit or quarry walls will be graded to 2(H):1(V) or flatter. Stockpiled overburden or unusable material can be used for grading.
    - Available organic soils will be spread over re-graded slopes. Available vegetative material will be spread over the organic soils to aid re-establishment of native species, and seeded as necessary.
    - At the end of use, un-reclaimed faces will be scaled of loose and dangerous rock so that the faces are left in a condition such that they will not collapse or allow loose rock to present a safety hazard.
    - The pit floor or pad will be graded to a flat or gently sloping shape, and all equipment and non-native debris and waste will be removed.
    - The active work area will be reclaimed and access roads will be removed or reclaimed.

- Invasive Plant Species – Construction activities requiring re-seeding of vegetation cover will utilize certified seed materials meeting requirements of the State of Alaska Seed Regulations (11 AAC 34 Articles 1 & 4) regarding purity, germination, and weed restrictions. Construction BMPs will be employed to keep equipment clean and prevent the spread of invasive species. BMPs can include establishing an equipment cleaning practice, invasive species education for staff and contractors, scheduling work at times when plants do not have viable seeds, using certified weed-free erosion control products, controlling invasive species at material sites, disposing of

spoil and vegetation contaminated with invasive species appropriately, re-vegetating with local native plant species, and developing a monitoring and treatment plan.

- Spill Prevention – Procedures to avoid or minimize the potential for spills into WOUS will be implemented. Refueling activities and fuel storage will take place in uplands and 100 feet from WOUS, except under the following circumstances: equipment that is not mobile or must remain on-site for prolonged periods to safely complete a construction task (e.g., drill rigs, cranes for structure installation, water pumps) may be refueled in wetlands, providing that proper temporary spill prevention, control, and containment procedures are employed.

- Fugitive Dust Control – The Project incorporates design features that minimize dust emissions that have the potential to adversely affect local air quality, from ore processing activities (e.g., ore crushing, ore conveying, and stockpiling of crushed ore) through a combination of emissions capture and control, and enclosures. A FDCP has been developed, which includes BMPs to minimize fugitive dust emissions.

Pipeline Area (PA)

The proposed PA facilities include a natural gas pipeline and fiber optic cable, compressor station, metering station, pig launcher/receiver site, check valves, and associated construction related facilities such as: camps and temporary airstrips, construction access roads, material sites, Pipe Storage Yard, shoofly and site access roads, HDD workspaces, water extraction site and access roads, work pads and the pipeline construction Right-of-Way (ROW). The following measures are included in the Project to avoid and minimize impacts to WOUS:

Avoidance and Minimization During Design

- Pipeline Area ROW Alternatives – Design considerations for the proposed pipeline route included selection of the shortest pipeline length possible to minimize Project footprint, while avoiding the following to the extent practicable: geotechnical hazards; hydrological hazards; known environmental and cultural sites, the Iditarod National Historic Trail (INHT); and potential land use conflict areas. The pipeline route and ROW design also considered seasonal construction schedules; constructability; and avoidance and minimization of impacts to WOUS. Several route alternatives were evaluated to traverse the Alaska Range, which is the largest geographical obstacle between the origin and terminus of the pipeline. The Jones River and Rainy Pass (Dalzell Gorge) routes were deemed practical, but the Jones River route was determined to be the preferred alternative to avoid geohazards in the Dalzell Gorge and potential land use conflicts with the INHT. The North Route avoids crossing the Happy and Skwentna Rivers, contains less WOUS impact acres and linear feet, and moves the PA ROW away from the INHT. Routing alternatives developed leading up to and through the Alaska Range are shown in Table 1 and Figure 7. Other re-routes avoided geohazards at the Castle Mountain and Denali Fault locations and the Susitna Flats State Game Refuge near the mouth of the Susitna River. Routes were moved higher on mountain sides and along ridgetops to avoid wetlands and streams along valley bottoms, as practicable.

Table 1 Alaska Range Alternative Locations

Pipeline Route Alternative	General Description	Estimated WOUS Acres Impacted
Dalzell Gorge	Route alternative from MP 106.1 to 153.1. Traverses Rainy Pass and parallels the South Fork Kuskokwim River.	257
Jones Route	Route alternative from MP 106.1 to 153.1. Diverges at Threemile Creek, crosses the Tatina River, and parallels the Jones River.	89
North Route (Proposed)	Route alternative from MP 85 to 112. Parallels the Happy River on the north side from its confluence with the Skwentna River to Threemile Creek.	44
Round Mountain Route	Route alternative from MP 85 to 112. Crosses the Happy River near its confluence with the Skwentna River and parallels the Happy River on the south side.	65

- Compressor Station – During design, the compressor station was converted from electric power to natural gas power. This eliminated the need for a transmission line. The transmission lines would have needed adjacent corridors with cleared vegetation. Transmission lines can lead to increased all-terrain vehicle use in accessible areas. One compressor station is adequate to meet the pipeline design capacity.

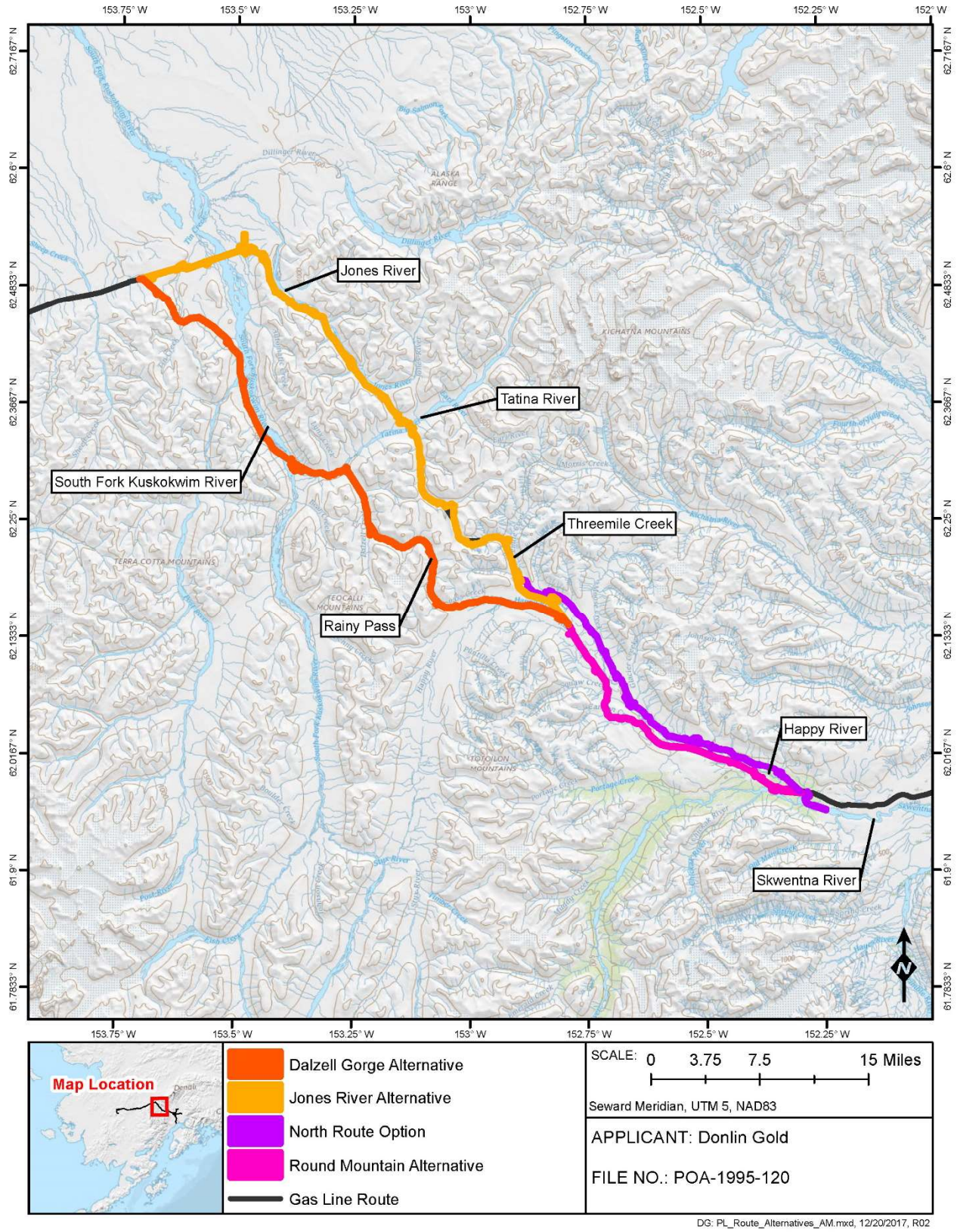
- Pipeline Diameter – The pipeline diameter was increased during design from 12-inch to 14-inch to ensure adequate capacity of natural gas for mine operations. This reduced the need for future upgrades to the pipeline.

- Roadless Design – The pipeline has been designed to be installed primarily underground, eliminating the need for road access which would have created permanent roads and long-term impacts along the pipeline route.

- Horizontal Directional Drilling (HDD) – All pipeline stream crossings were analyzed for flow, width, and characterization to determine crossing modes to avoid major diversions in rivers and major re-routes. HDD methods will be used to install the pipeline underneath the Skwentna, Happy, Kuskokwim, George, East Fork George, and the North Fork George Rivers. Excavated cuttings from HDD sites will not be placed in waterbodies or in drainages. Without HDD crossings, there would be a larger disturbance footprint for gravel pads necessary for crossing and work areas, and likely aerial crossings of these rivers. Criteria for HDD stream crossing locations included 100-year flood recurrence interval, depth of cover, setbacks for pipe exposure, bank mitigation/restoration to prevent erosion, bank protection, fish habitat and recreation value, and adverse impacts to WOUS. The State of Alaska will provide a Certification

under Section 401 of the Clean Water Act. The Project will comply with the State's Water Quality Standards.

Figure 7 Alaska Range Alternative Locations



- Use of Existing Facilities and Infrastructure – The barge landing in Cook Inlet would utilize an existing landing area and access road. Existing winter roads would be used to access the eastern portions of the pipeline. The Farewell airstrip will be used to access portions of the pipeline and transport equipment and personnel.

- Use of Barge, and Winter Access Routes – Barge traffic and winter access routes included in the design reduce the need for additional permanent roads. Construction of barge landings on the Kuskokwim River will not require placement of fill below ordinary high water. The barge landing on Cook Inlet is an existing developed facility. The Cook Inlet barges will use their attached loading ramps to help offload pipe and supplies. No dredging will be conducted and no fill will be placed below mean high tide.

- Reduced Footprint Design of Ancillary Facilities – Where practicable, material sites, airstrips, and camps are within the pipeline ROW or adjacent to each other to enhance collocation, decrease the need for ancillary roads, and thus reduce footprint size.

- Placement of Material Sites to Avoid and Minimize WOUS – The PA includes 69 material sites totaling 1,008 acres. Six of the PA material sites impact wetlands and waters, totaling 10.4 acres of impact. Of the six material sites, three (Material Sites-01, 38, and 41), were identified as most likely to provide wetland restoration and creation opportunities based on proximity to groundwater hydrology and final grading elevations.

- Placement of Other Facilities to Avoid and Minimize WOUS – Work pads will be the minimum size necessary for equipment and construction activities and were sited in uplands along the pipeline ROW. Temporary construction camps and airstrips were sited in uplands. Existing winter trails will be integrated into the winter ice routes for transportation of pipeline construction infrastructure. The timing of the construction and use of ice roads eliminates the need for permanent gravel access roads and construction pads. The pig launcher/receiver site (Figure 8) was sited in uplands.

- Co-located Facilities – Several facilities along the pipeline will be multi-purpose. These include: material sites, laydown areas, equipment storage, staging areas, fueling areas, material and pipeline stockpiling, camp units, and airstrips.

    - The compressor station (Figure 9) is sited at an existing previously disturbed area. The Kuskokwim River HDD crossing includes a pipe laydown area collocated with a material site (Figure 10). Figure 9 and Figure 10 illustrate the siting of these facilities in uplands to avoid wetlands and WOUS.

    - The Skwentna River HDD Exit will be located on a material site pad.

    - The currently operating Cook Inlet Barge Landing will be used for supplies transport in addition to stockpiling pipe and materials.

Figure 8 Pig Launcher/Receiver Site

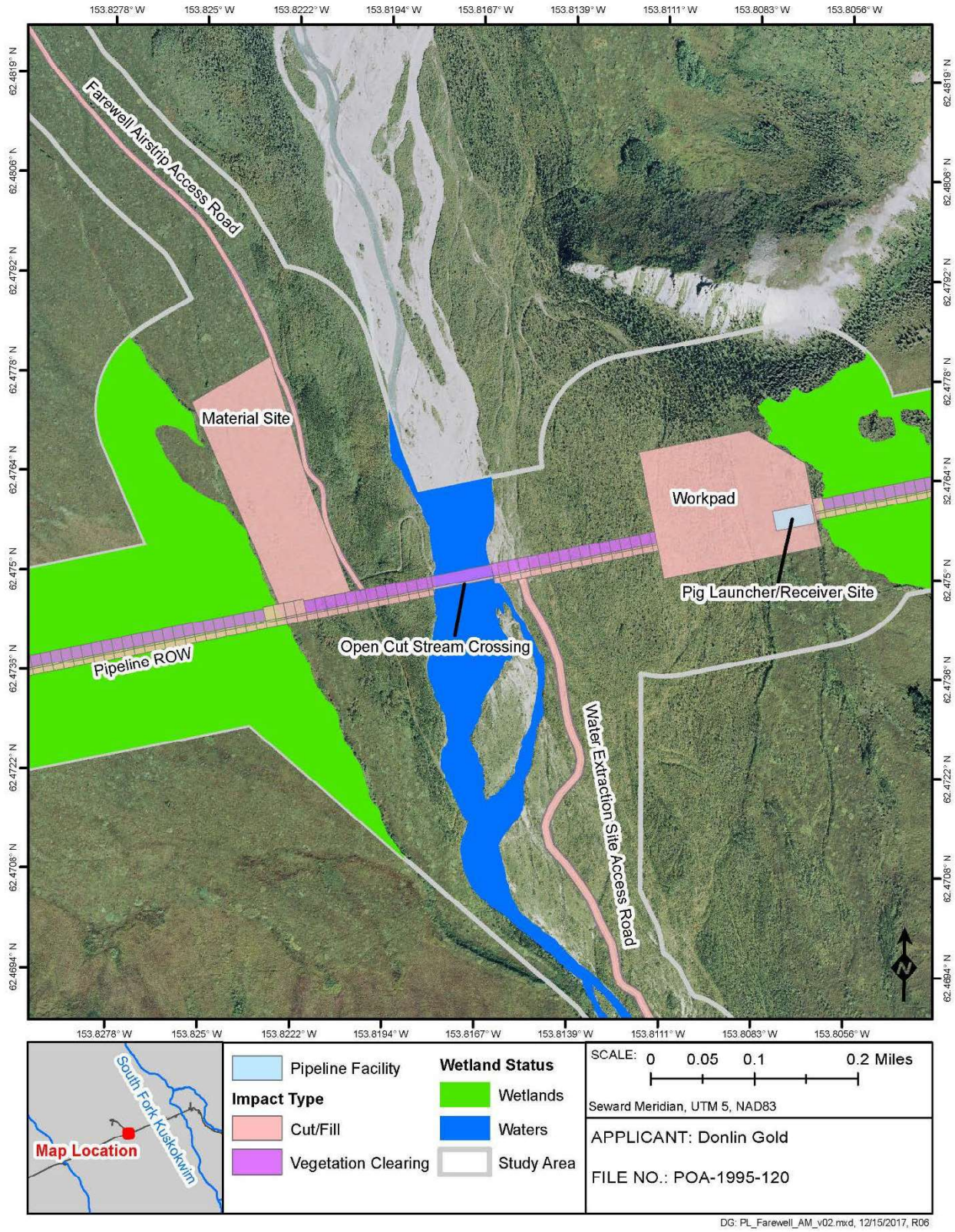


Figure 9 Compressor Station Location

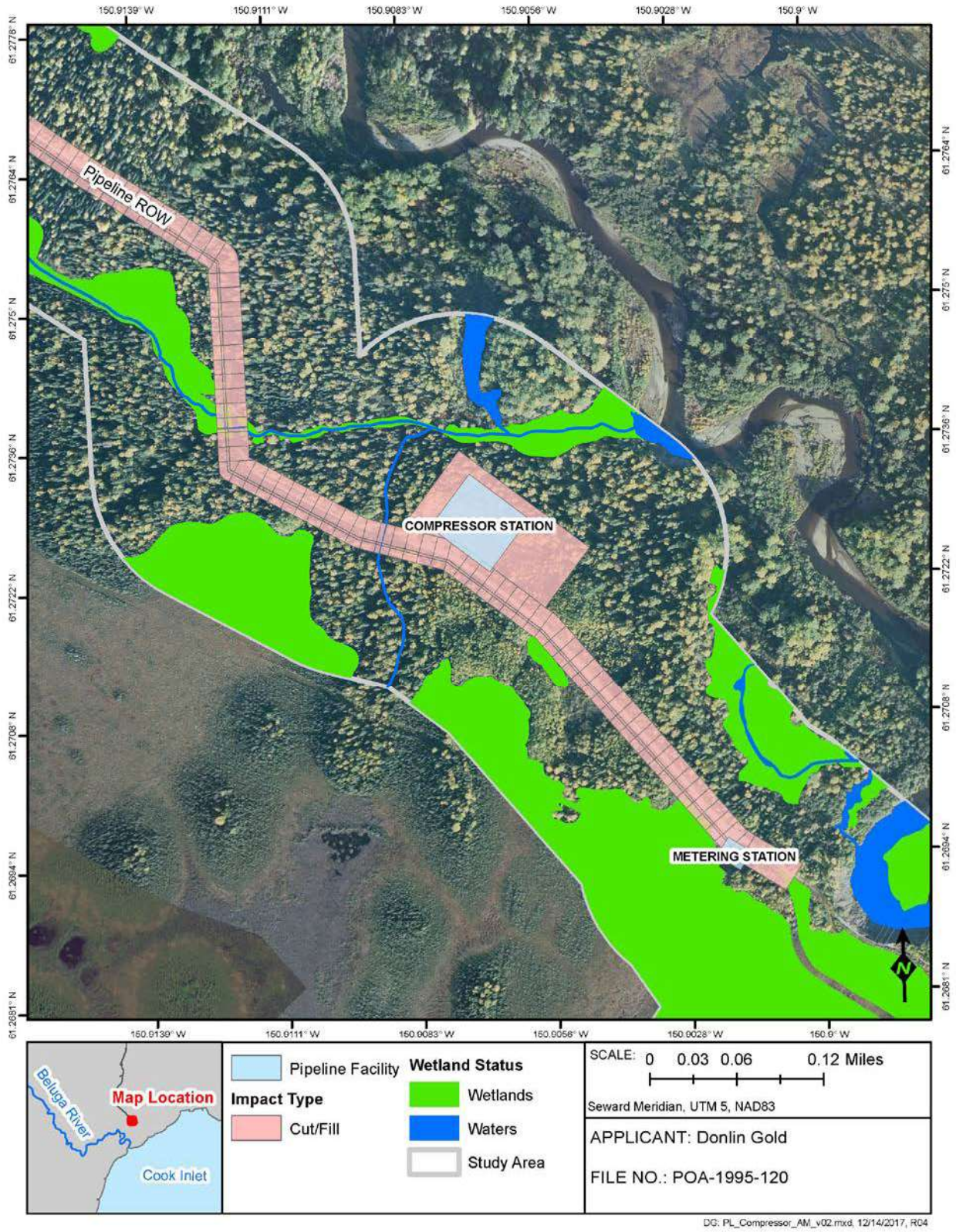
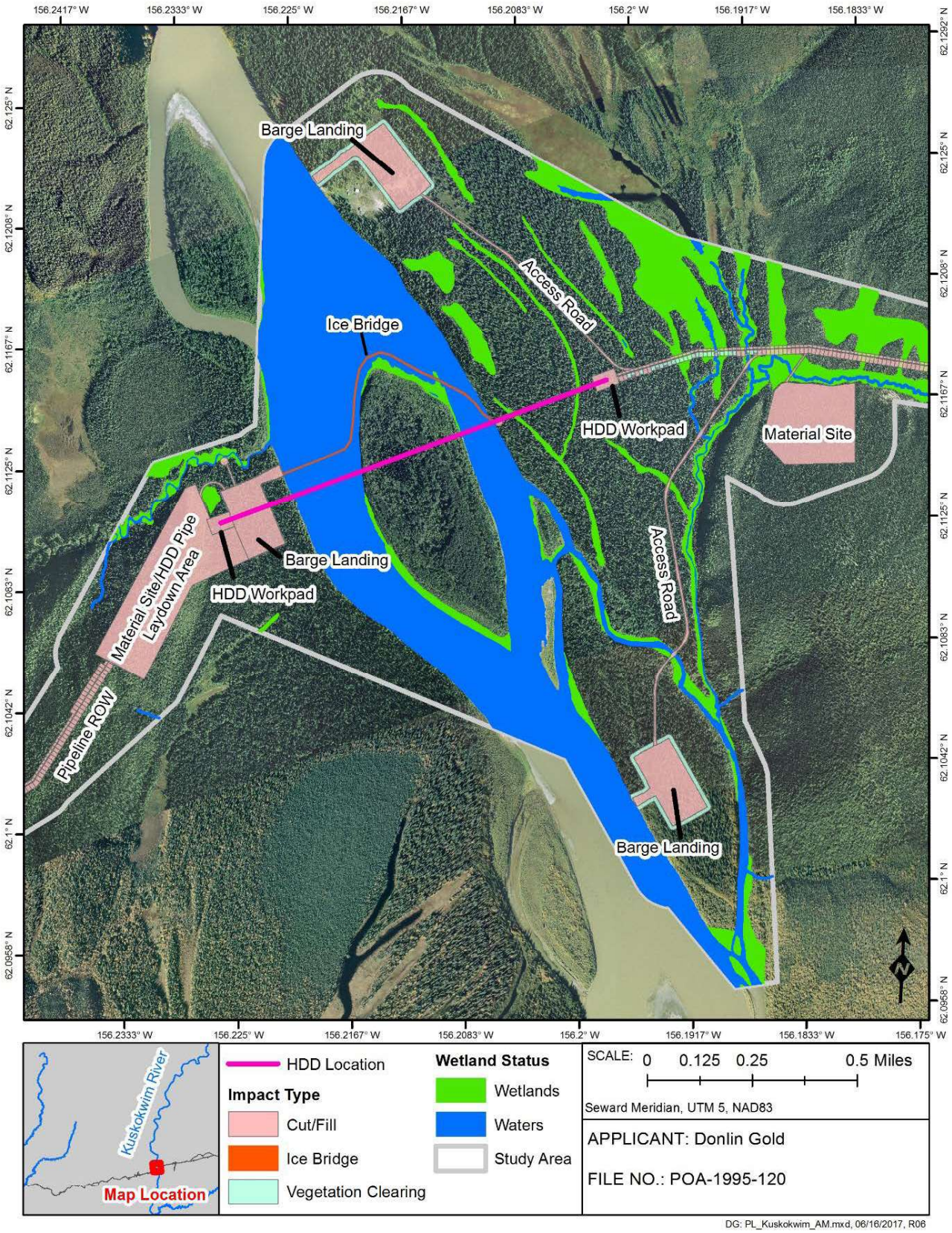


Figure 10 Kuskokwim River HDD Crossing Location



- Stream and Drainage Crossings – The pipeline was designed to minimize the number of stream and drainage crossings, and the total pipeline length and ROW width. The pipeline ROW was designed to the minimum width necessary to complete construction activities: approximately 100 to 150 feet for construction in wetlands depending on site-specific conditions.

Minimization During Construction

- Vegetation Clearing Activities – Vegetation clearing for the proposed PA facilities will be scheduled to occur outside the migratory bird nesting season as best possible, consistent with USFWS guidance. If avoiding the suggested window is not possible, the area will be surveyed for the presence of nests immediately prior to clearing activities during the restricted clearing periods, and identified nest can be provided appropriate protection; or if otherwise authorized by permit from the USFWS. The MBTA prohibits the killing or harassment of migratory birds, and migratory bird nests, eggs, or nestlings if work were to be conducted in nesting habitat during the spring and summer breeding season. Clearing will not be conducted outside established vegetation clearing boundary limits. Cut vegetation will be piled within the Project disturbance limits, so as not to block surface water flows or adversely affect nearby WOUS except when used to provide BMPs for stormwater management under the MSGP.

- Erosion Control Measures – Erosion control and construction methods will be described in the SWPPP, and will comply with the State of Alaska 2016 Construction General Permit for Stormwater Discharges for Large and Small Construction Activities. BMPs for embankment stabilization, including contouring and seeding will be required Project-wide to reduce embankment erosion and potential sediment runoff into WOUS. Construction methods in wetlands will minimize construction-related effects on wetlands, including marking wetland boundaries and clearing limits, using winter construction to the maximum extent practicable, confining activities to the construction zone to prevent disturbance of surrounding vegetation, maintaining slope stability, controlling erosion, using mats or other ground protection during non-winter months, maintaining existing wetland hydrology, minimizing disturbance in wetlands, and constraining permanent facilities to uplands. Mats will be utilized in a leap frog construction technique. All mats will be removed from wetlands. The State of Alaska will provide a Certification under Section 401 of the Clean Water Act. The Project will comply with the State's Water Quality Standards.

    - While working in wetlands, crews will use mats, where practical to protect vegetation and soils from equipment; low ground-pressure tires will be used on equipment operating on or near wetlands. Ditch plugs will be installed in the pipe trench at stream crossings and at wetland-upland interfaces as needed.

- Stream and River Crossings – Open-cut stream crossings will be used during normal to low flow and low-habitat sensitivity periods. Disturbed areas will be stabilized using geotextile matting, gravel blankets, riprap, gabions, or other geosynthetics. All stream banks will be stabilized and re-vegetated as soon as practicable following the methods described in the Project restoration plan. Where practicable, mobile modular bridges will be used. The East Fork of the George River will be crossed with a temporary floating bridge during construction. For descriptions of reclamation at stream crossings, see Engineering Drawings PA-142T through PA-147T.

- Temporary Construction Activities – Grading will only occur where necessary for equipment to access construction locations. The organic layer will remain intact except at the trench cut or where side hill cuts occur along the alignment. On steep side slopes, double benching will be employed to reduce the cut and fill volume and associated impacts. If sufficient organic soils are present, these materials will be segregated and stockpiled for use during reclamation. Where necessary, material work pads will be used over thaw-unstable permafrost. Unless specifically required, the organic layer will be left intact to slow thermal degradation and to aid in final reclamation.

- Construction Seasons – Most areas underlain by permafrost will be crossed during winter to minimize disturbance from trenching. A seasonal construction timeline minimizes impacts to WOUS, by timing construction activities in lowlands in the winter and in uplands during the summer. Approximately 60 percent of the total pipeline length would be constructed during frozen winter conditions to minimize wetland and soil disturbances from equipment (Pipeline Construction Execution Plan December 2016). Snow and ice roads with frost packing will provide a stable surface for equipment to operate.

- Development of Material Sites – The following construction guidelines limit the disturbance footprint, prevent impacts to nearby WOUS, and minimize the overall impacts to WOUS:

    - Source material testing for metal leaching and acid rock drainage potential will be completed on hard rock material sites prior to mining. Material that does not meet environmental standards will not be used as fill. By not using acid generating and metal leaching material, water quality standards are met.

    - Material site and work area boundaries will be surveyed and monumented with a GPS device as well as physically, using rebar stakes and flagging to avoid impacting WOUS outside of the permitted area.

    - Vegetation and organic soils will be stockpiled separately from overburden in uplands as practicable for future use in reclamation.

    - Appropriate offsets will be provided between overburden berms and the active pits.

    - Material work pads will be used in summer construction over thaw-unstable permafrost and any overlaying wetlands and soft soils; the organic layer will be left intact to slow thermal degradation and to aid in final reclamation.

    - Mining will proceed in a benched manner. Individual benches will be no more than 40 feet apart vertically, and will be no narrower than 20 feet wide. Multiple benches can be in production at one time, with slope angles of approximately 2.0(H):1(V).

- Material Site Reclamation – When no longer needed, material sites will be reclaimed following these guidelines:

    - Overburden or unusable material piles will be graded after use to slopes of 3(H):1(V), or flatter.

- Except where the steepness of the wall makes it impractical or impossible, pits and quarry walls will be reclaimed as follows:
    - Pit or quarry walls will be reclaimed when future development is not required.
    - Pit or quarry walls will be graded to 2(H):1(V) or flatter. Stockpiled overburden or unusable material can be used for grading.
    - Available organic soils will be spread over re-graded slopes. Available vegetative material will be spread over the organic soils to aid in re-establishment of native species, and seeded as necessary.
    - At the end of use, un-reclaimed faces will be scaled of loose and dangerous rock so that the faces are left in a condition such that they will not collapse or allow loose rock that presents a safety hazard.
    - The pit floor or pad will be graded to a flat or gently sloping shape, and all equipment and non-native debris and waste will be removed.
    - The active work area will be reclaimed and access roads will be removed or reclaimed.

- Invasive Plant Species – Construction activities requiring re-seeding of vegetation cover will utilize certified seed materials meeting requirements of the State of Alaska Seed Regulations (11 AAC 34 Articles 1 & 4) regarding purity, germination, and weed restrictions. Construction BMPs will be employed to keep equipment clean and prevent the spread of invasive species. BMPs can include establishing an equipment cleaning practice, invasive species education for staff and contractors, scheduling work at times when plants do not have viable seeds, using certified weed-free erosion control products, controlling invasive species at material sites, disposing of spoil and vegetation contaminated with invasive species appropriately, re-vegetating with local native plant species, and developing a monitoring and treatment plan.

- Spill Prevention – Procedures to avoid or minimize the potential for spills into WOUS will be implemented. Refueling activities and fuel storage will take place in uplands and 100 feet from WOUS, except under the following circumstances: equipment that is not mobile or must remain on-site for prolonged periods to safely complete a construction task (e.g., drill rigs, cranes for structure installation, water pumps) may be refueled in wetlands, providing that proper temporary spill prevention, control, and containment procedures are employed.

References

Michael Baker International. 2017a. Preliminary Jurisdictional Determination - Donlin Gold Project-Southwest Alaska. December 2016.

Michael Baker International. 2017b. North Route Addendum to the Preliminary Jurisdictional Determination – Donlin Gold Project – Southwest Alaska. August 2017.